WHAT IS CLAIMED:

1.   A method executed by a digital signal processing system of generating a signature associated with a known signal, the signature comprised of a set of numeric values of at least one element and corresponding to at least time frame of the signal, such known signal being identified by an identification index and such time frame being identified by a time frame index, comprising:

Transforming the at least one time frame of the signal into the frequency domain, such that for such time frame there is a pre-determined number of frequency magnitude values grouped in at least one frequency band of pre-determined width;

Calculating for each frequency band a single numeric value that is equal to a pre-determined function of the frequency magnitude values grouped within the frequency band;

Storing the signature in a computer database with a reference to its corresponding time frame index and the identification index.

2.   The method according to Claim 1 where the pre-determined is comprised of either: (i) a linear combination, (ii) a quadratic function, (iii) a centroid, (iv) a variance, or (v) an n-th order moment, where n is a pre-determined number.

3.   The method according to Claim 2 further comprising dividing the function result by the pre-determined number of frequency magnitude values in the corresponding frequency band.

4.   The method according to Claim 1 where the function is a linear combination where the coefficient of each term of the linear combination is substantially equal to the ordinal index of the frequency magnitude value within the frequency band divided by a predetermined constant.

5.   The method according to Claim 1 where the number of predetermined frequency bands is between 10 and 100.

6.   The method according to Claim 1 where the frequency bands occupy a range of above 0 Hz and approximately equal to or below 4000Hz

7.   The method according to Claim 4 where the predetermined constant is substantially equal to the sum of the frequency magnitude values in the corresponding frequency band.

8.   The method according to Claim 7 further comprising dividing the function result by the pre-determined number of frequency magnitude values in the corresponding frequency band.

9.   The method according to Claim 1 where the width of a frequency band is set to be substantially larger than the magnitude of the frequency shift that results from a predetermined maximum amount of variation in the playback speed of the known signal, such shift being measured at either the upper or lower boundary of the frequency band.

10.   The method of Claim 9, where the upper boundary of the frequency band is equal to the lower boundary plus a value equal to the absolute value of the maximum relative playback speed variation, times the lower boundary, times a constant, where the constant ranges between 1 and 100.

11.   The method of Claim 10, where the constant is between 10 and 50.

12.   The method according to Claim 9 where for each frequency band, the upper boundary of the frequency band is substantially equal to the value of the lower boundary of the frequency band times the sum of one plus a pre-determined value.

13.   The method according to Claim 10 where the pre-determined value is substantially between the values of 0 and approximately 10.

14.   A method executed by a signal processing system for determining whether a portion of a detected signal of a pre-determined number of sequential time frame duration is substantially the same signal as a portion of at least one known signal out of a plurality of known signals, each portion of the plurality of known signals comprised of a plurality of sequential time frame duration and each time frame of the known signal having an identification index and a time frame index, comprising:

Calculating for at least one of the time frames of at least one of the known signals a first signature comprised of a set of numbers derived from a pre-determined number of frequency magnitude values detected during the time frame;

Storing in a computer database each first signature with a reference to its corresponding signal identification index and a reference to the approximate location in time of the time frame from substantially the beginning of said known signal;

Calculating for at least one of the time frames of the detected signal a second signature comprised of a set of numbers derived from a pre-determined number of frequency magnitude values detected during the time frame;

Selecting from the stored set first signatures those first signatures that together with the second signature meet a predetermined matching criteria, where such selection occurs repeatedly as a result of the arrival of each new time frame in the detected signal.

15.   The method of Claim 14 where the first signature and second signature is calculated and stored using one of the methods of Claim 1, Claim 2 or Claim 9.

16.   The method of Claim 14 where the predetermined matching criteria comprises:

Calculating a set of absolute values of the differences between each ordinal member of the set of numbers comprising the first signature and each such member's corresponding ordinal member of the set of numbers comprising the second signature;

Calculating a sum of the absolute values; and

Determining whether the sum produces a value less than a pre-determined value.

17.   The method of Claim 14 where the predetermined matching criteria comprises:

Calculating a set of absolute values of the difference between each ordinal member of the set of numbers comprising the first signature and each such member's corresponding ordinal member of the set of numbers comprising the second signature;

Calculating a sum of the set of absolute values;

Determining whether the sum is the minimum sum for all the first signatures tested.

18.   The method of Claim 14 where the predetermined matching criteria comprises:

Calculating an error value using one of the group: (i) the approximate vector distance from the first signature to the second signature; (ii) the approximate L-1 norm between the first signature and the second signature; (iii) the approximate maximum difference between any member in the first signature and its corresponding ordinal member in the second signature; (iv) the approximate minimum difference between any member in the first signature and its corresponding ordinal member in the second signature; (v) the approximate average difference between all of the members in the first signature and their corresponding members in the second signature.

19.   The method of Claim 14 further comprising the steps:

Determining whether the number of first signatures that meet the predetermined matching criteria and have the same identification index is equalt to or greater than a number between and including K+1 and 2K+1, where K is evaluated such that 2K+1 is equal to the predetermined number of time frames.

20.   The method of Claim 14 where the matching criteria comprises:

Determining whether the values of the time frame indices corresponding to matching first signatures with the same identification index increase substantially monotonically in relation to the values of the time frame indices of the matching time frames of the detected signal.

21.   The method of Claim 14 where the matching criteria comprises:

Determining whether the values of the time frame indices corresponding to matching first signatures with the same identification index are substantially linearly correlated

with the values of the time frame indices of the matching time frames of the detected signal.

22.   The method of Claim 14 where the matching criteria comprises:

Calculating an approximate regression analysis between the values of the time frame indices corresponding to matching first signatures with the same identification index and the values of the time frame indices of the matching time frames of the detected signal.

23.   The method of Claim 22 where the determination is comprised of a test whether the correlation coefficient is greater than or equal to approximately .5.

24.   The method of Claim 23 where the determination is comprised of a test whether the linear slope is within an approximate range from and including 2 to and including 6.

25.   The method of Claim14 where the time frame indices of the detected signal and a matching known signal are periodically tracked to confirm that in a sequence of at least two time frames, the time frame indices of the detected signal increase approximately in correspondence with the increase in the time frame indices of the matching known signal. .

26.   A method executed by a signal processing system for determining whether a portion of a detected signal of a pre-determined number of sequential time frame duration is substantially the same signal as a portion of at least one known signal out of a plurality of known signals, each portion of the plurality of known signals comprised of a plurality of sequential time frame duration

and each time frame of the known signal having an identification index and a time frame index, comprising:

Calculating for at least one of the time frames of at least one of the known signals a first signature comprised of a set of numbers derived from a pre-determined number of frequency magnitude values detected during the time frame;

Storing in a computer database each first signature with a reference to its corresponding known identification index and a reference to the approximate location in time of the time frame from substantially the beginning of said known signal;

Calculating for at least one of the time frames of the detected signal a second signature comprised of a set of numbers derived from a pre-determined number of frequency magnitude values detected during the time frame;

Selecting from the stored set of first signatures those first signatures that together with the second signature meet a predetermined matching criteria;

Storing in at least one data structure and the time frame index and the identification index corresponding to the matching first signatures.

Deleting from the data structures those time frame indices and corresponding identification indices where fewer than K+1 entries in the list have the same identification index, where K is calculated such that 2K+1 is equal to the predetermined number of time frames constituting the portion of the detected signal;

Deleting from the list those time frame indices and identification indices where the time frame indices of the first signature are not confirmed to increase substantially in synchrony with the time frame indicies of the detected signal.

27.   A method executed by a signal processing system of searching a database comprised of a set of at least n first signatures with corresponding identification indices and time frame indices, where each first signature represents the frequency components of a known signal during the time frame, the search looking for all first signatures that together with a second signature meets a pre-determined matching criteria, where the second signature represents the frequency components of a detected signal during a time frame , comprising:

Storing in computer memory a first data array comprised of all of the first signatures, whereby the n-th row in the first data array is the set of members of the n-th first signature;

For at least one column in the first data array, sorting within the computer memory, the elements of the column in either ascending or descending order;

Storing in computer memory an additional data array where one element in the second data array corresponds to an element in the one column of the first data array, and the value of the one element in the second data array cross-indexes to where the corresponding element in the first data array originated prior to the sorting step;

Applying a search using the second signature to find best match between the second signature and the rows of the first data array.

Recovering the identification index and time frame index of any matching first signature by using the cross-index of the second data array and applying it to the matching row.

28.   The method of Claim 24 where, the search algorithm is one of: binary search, B Tree, linear search, heuristic tree searching, depth first search, breadth first search.

29.   A method executed by a signal processing system of searching a database comprised of at least one first signature representing a signal, using a query comprised of a second signature where the first and second signatures are both sets of a predetermined number of elements, each element a number, comprising:

For each first signature, applying a predetermined calculation to calculate a first integer as a function of a subset of elements comprising each first signature;

Storing in a computer memory location corresponding to the value of the first integer a reference to the corresponding first signature used in calculating the first signature;

Calculating a second integer using the same predetermined calculation applied to the corresponding subset of the second signature;

Selecting memory locations corresponding to integer values within a predetermined error function from the second integer;

Determining any first signatures and their identification index and time frame index corresponding to the selected memory locations.

30.   The method of Claim 29 where the predetermined calculation is a linear combination of at least two elements of the signature.

31.   The method of Claim 29 where the subset has less than five elements of the first signatures.

32.   The method of Claim 2 where the error function is one of: (i) a determination whether the two integer values are within a threshold distance apart; (ii) a selection of first integer that is the minimum distance to the second integer relative to all other first integers.

33.   The method of Claim 14 where the signal is comprised of programming of

unknown identity that has not been found to match any portion of any known signal

further comprised of time frames with corresponding signatures comprising:

        Creating an arbitrary identifier with an identification index;

        Assigning the identification index to those signatures derived from the

        signal;

        Replacing the arbitrary identifier with a correct identification when the

        unknown signal is identified.

34.   The method of Claim 33 further comprising replacing the arbitrary

identification index in the database with a pre-existing identification index that

references valid identification data identifying the signal.

35   A machine comprising a central processing unit, a digital data transceiver

device and a data storage device comprised of any machine readable media, where the

machine readable media contains a computer program that when executed by the

machine, performs the methods of Claims 1 - 34.

36. A machine readable media of any type, which contains data that is a computer

program that when executed by a computer, performs the methods of Claims 1 - 34.